

US EPA ARCHIVE DOCUMENT

Voluntary Information Programs and Environmental Regulation: Evidence from 'Spare the Air'

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Introduction

- ❑ Voluntary programs and environmental quality
 - Community Right-to-Know Act
 - Climate Wise
- ❑ Mostly target firms, but could be profit maximizing
- ❑ Hinge on consumer altruism → voluntarily forgo consumption despite no direct incentive

“Spare the Air” and ozone regulation

- *ozone = f (NO_x, VOC, weather, solar_radiation)*
- Automobile emissions are precursors to ozone
 - 49% of Bay Area, Sacramento Valley, and San Joaquin Valley NO_x from on-road mobile sources
- AQS based on “3-year average of the fourth-highest daily maximum ”
- Traditional regulation: shift entire distribution of NO_x, VOC
- Alternative: focus on episodic conditions
 - If forecasted ozone exceeds AQS, issue STA to encourage trip reduction
 - Widely publicized
 - Free-fare on BART since 2004
 - Trip reductions:
 - Lower ozone precursors
 - Lower ozone levels
 - Increase AQS attainment

Goal of project

- ❑ Goal 1: Impact of STA on commuting behaviors
 - Test of altruism
 - Voluntary programs and environment
- ❑ Goal 2: Impact of STA on ozone
 - 8-hour standard contested
 - ❑ Increased marginal abatement costs
 - ❑ Natural variability
 - ❑ Climate change predicts ozone increases
 - Ozone outreach programs, such as STA, may be more efficient tool
 - ❑ Implemented in Sacramento, Atlanta, Charlotte, Houston, Pittsburgh, ...

Economic theory

- ❑ Individuals receive value from contribution [warm-glow, existence value]
 - Value increases with pollution
- ❑ 3 choices: drive alone, public transit, no trip
- ❑ 2 types of trips: commuting, discretionary
- ❑ Fact: ozone peaks late afternoon
- ❑ Intuitive prediction except:
 - STA signal as health risk [Neidell]
 - ❑ Most exposure from public transit
 - Free-rider issue: reduce traffic and travel time

Economic theory

□ Commuting trips

- No option to cancel trip
- Health effects minimal

→ Contribute if warm-glow outweighs reduced travel time

□ Discretionary trips

- Option to cancel trip
- Health effects largest during mid-day

→ Cancel over drive alone if warm-glow outweighs reduced travel time

→ Public transit if warm-glow net of health effects outweighs reduced travel time

- Increase in public transit least likely during peak ozone period

Methodology

- Endogeneity of STAs
- Solution: regression discontinuity design (RDD)
 - $oz_{rt}^f = f(oz_{rt-1}, weather_{rt}^f, solrad_t) \geq trg$
 $trg = .081 \text{ ppm} \geq 2003, trg = .084 \text{ ppm} \leq 2002$
 $STA_t = 1\{oz_t^f = \max_t(oz_{rt})\}$
 - If days above trigger $\approx$ days below, discontinuity in transportation = effect of STA
- $y_{kt} = \beta * STA_t + \delta_0 * oz_t^f + \delta_1 * X_t + \theta_k + \mu_t + \varepsilon_{kt}$
if $trg - \Delta \leq oz_t^f \leq trg + \Delta; \Delta = .01 \text{ or } .02 \text{ ppm}$
- Also diff-in-diff using *SCAQMD*
- Overall and by time of day

Data

- ❑ STAs and ozone forecasts from BAAQMD
 - June 1 to October 15
 - 2001-2004
- ❑ Traffic data from Freeway Performance Measurement System (PeMS)
 - Real-time traffic flow at 92 monitors in BAAQMD; 50 in SCAQMD
 - Aggregate 5 minute intervals to 1 hour
- ❑ BART
 - Hourly entrances for all stations
 - Free fares in 2004
- ❑ Daily pollution from CARB
- ❑ Observed and forecasted weather from NCDC

Data

year	STA=1	All obs. STA=0	+/- .02 of trigger STA=0	+/- .01 of trigger STA=0
2001	4	130	23	7
2002	7	127	32	8
2003	9	125	63	21
2004	3	131	38	8
Total	23	513	156	44

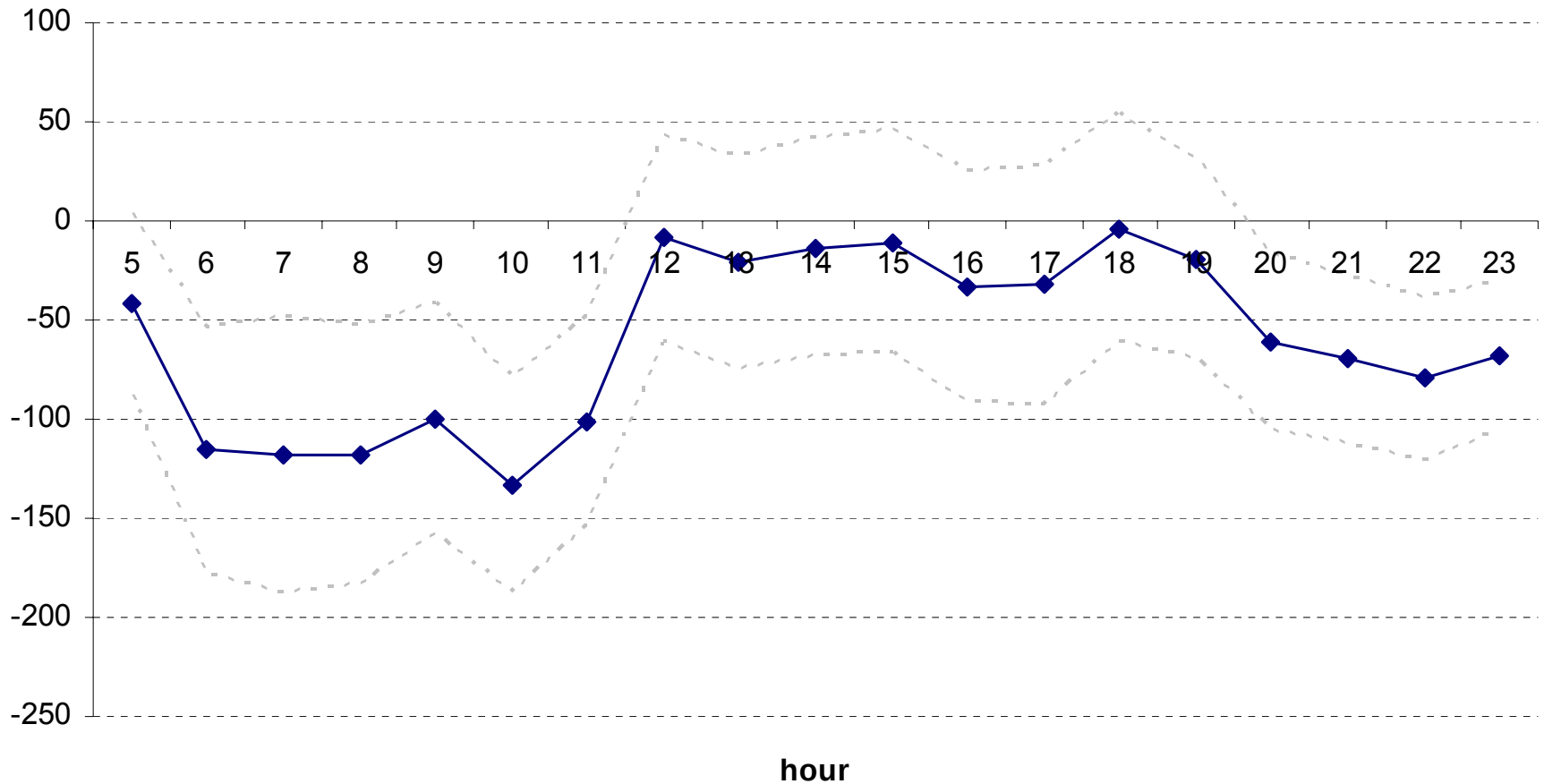
Covariate balance

	1	2	3	4
	mean	All obs	+/- .02 of trigger	+/- .01 of trigger
precipitation	0.184	-0.069	0.024	0.023
max. temperature	81.92	2.115**	0.148	-0.255
precipitation (in.) (lag)	0.184	-0.096	-0.009	-0.006
max. temperature (lag)	82.015	1.733**	0.13	-0.082
forecast max. temp.	81.524	2.079**	0.286	0.262
forecast sunny	0.637	0.865**	-0.035	-0.257
forecast partly cloudy	0.326	-0.80**	0.036	0.268
holiday (lag)	0.024	0.13	0.221	-0.091
weekday	0.707	0.273	0.16	0.017

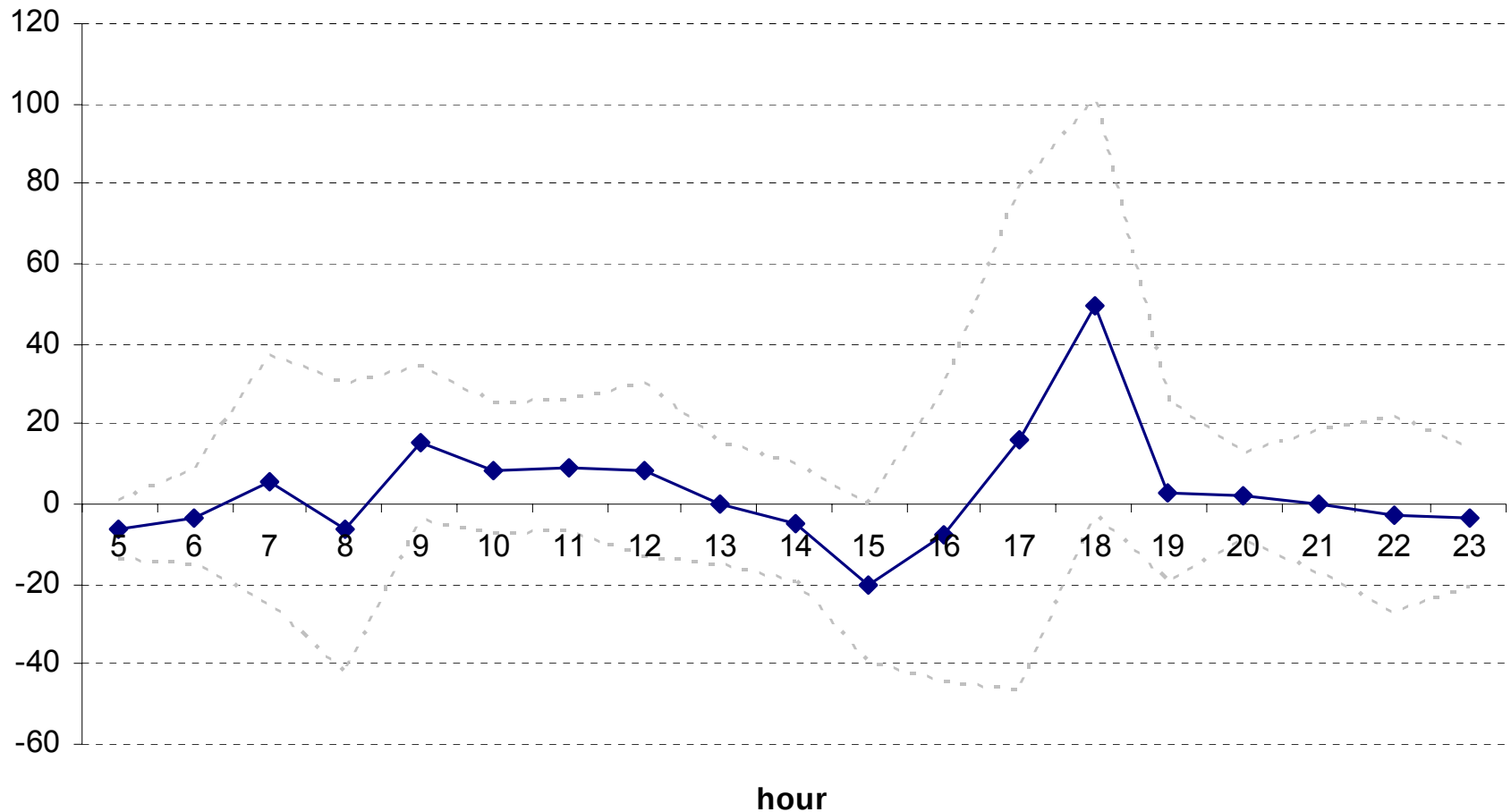
Effect of STA on all day traffic and BART

	1	2	3
	all obs	+/- .02 of trigger	+/- .01 of trigger
<u>A. Traffic</u>			
monitor random effect	-1106.0	-2332.3**	-2001.0*
	-1.7%	-3.5%	-3.1%
monitor fixed effect	-995.2	-2111.7*	-1683.4
	-1.5%	-3.2%	-2.6%
Observations	70805	24073	8768
# of days	536	179	67
# of monitors	142	142	142
<u>B. BART</u>			
station random effect	34.6	40.3	29.4
	0.6%	0.7%	0.5%
station fixed effect	32.5	41.4	39.2
	0.5%	0.7%	0.6%
Observations	21391	7160	2520
# of days	536	179	67
# of stations	43	43	43

Effect of STA on Traffic by Hour ($\pm.02$ of trigger)



Effect of STA on BART by Hour ($\pm .02$ of trigger)



Effect of STA on 1-hour and 8-hour ozone

	1 all obs	2 +/- .02 of trigger	3 +/- .01 of trigger
<u>A. 1-hour ozone</u>			
monitor random effect	0.003*	-0.001	-0.001
	5.6%	-2.2%	-2.6%
monitor fixed effect	0.003*	-0.001	-0.002
	5.4%	-2.3%	-3.0%
Observations	6406	2139	777
# of days	536	179	65
# of monitors	12	12	12
<u>B. 8-hour ozone</u>			
monitor random effect	0.003*	-0.001	-0.002
	6.3%	-2.0%	-4.0%
monitor fixed effect	0.003*	-0.001	-0.002
	6.1%	-2.1%	-4.5%
Observations	6406	2139	777
# of days	536	179	67
# of monitors	12	12	12

Conclusion

- ❑ Individuals respond to STAs...
 - ...but not in sufficient volume
 - Impact of further outreach unclear because of counter-incentives
 - Free fare significant loss in gov't revenue, increase in complaints
 - If no effect in Bay Area, where could it work?
- ❑ Costs to consumer from switching unknown
- ❑ Generalize to other voluntary programs?